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REVIEW OF HR-73C CONFIGURATION
DEVELOPMENT PROGRAM
MARCH - DECEMBER 1958

Engineering Report Number 5364

12 January 1959

25X1A

Project Manager: [redacted]

Chief Engineer:

Director of Engi

25X1A

Report prepared by: [redacted]

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ABSTRACT

The development program of the HR-73C Configuration is reviewed chronologically from March to December 1958. Achievements are discussed, an appraisal is made, and general recommendations are offered. Certain continuing records of data, completed to date, are included.

INDEX

INTRODUCTION

In early 1958, Project support of the HR-73C Configuration (C System) was terminated, and, in March 1958, FOG initiated a program to develop the C System. The work was undertaken by this Corporation as prime contractor with the continuous participation of a subcontractor and part time assistance from vibration consultants. This report chronologically details the more important phases and results of this development work from its initiation until the cessation of activity in December 1958.

During this period there were several significant achievements and several important lessons learned. These are discussed separately so that a fuller consideration may be given without interruption to the chronology. In view of the experiences encountered, certain general recommendations for similar programs are offered.

To provide a completed record until this date of certain factual data, four appendices have been included: The first indexes other reports containing more detailed information; the second lists the most important meetings which influenced the program; and the last two summarize system performance during this program.

This report provides a factual description of past events, and, furthermore, a general indication of present status. Since recommendations for future activity greatly depend on value judgements (worth of aerial reconnaissance information as contrasted with other intelligence, utility of the C System as compared with other reconnaissance systems, etc.), this important subject will be considered separately in a later report. Similarly, the disposition of equipment (as well as a detailed enumeration of equipment) will be included in the future report.

CHRONOLOGICAL HISTORY

The initial work on this program was an evaluation of the configuration, conducted from 15 March to 14 May 1958. The principal objective of this proposed evaluation program was to reduce the speculation regarding achievable performance.[1] In actual fact, the entire evaluation program was devoted to the investigation of one problem - the problem of vibration induced degradation of the image. As a parallel effort, the subcontractor was writing a review report at this time. The resulting report from the subcontractor indicated that all electromechanical functions in the camera operated satisfactorily, and implied that there would be no difficulties encountered in the electromechanical operation during future work with the camera.

STATINTL

During the evaluation, two other companies cooperated in considering

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the problems associated with the configuration. These companies were [redacted] who specialize in the area of vibration and conducted a thorough vibration survey[2] under a subcontract from this corporation. The other

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company was the [redacted] who considered the problem of stabilization and vibration, not as a subcontracted effort, but to submit a proposal[3] for work they would have been willing to undertake.

At the end of the evaluation it was concluded that 20 to 25 lines per millimeter could be obtained operationally if certain modifications were made,[4] but this was still based on considerable speculation.[5] These modifications were concerned solely with correcting vibration problems. It was also recommended that, when the modifications were completed, a program of flight testing should be initiated. The principal subcontractor proposed additional work to be undertaken during the modification program.[6] This work included

1 - Engineering Report 5232, page 3
2 - Engineering Report 5249, pages 21-25
3 - Engineering Report 5249, pages 26-32
4 - Engineering Report 5249, page i
5 - Engineering Report 5249, pages 16-18
6 - Meeting of 22 May 1958 (See Appendix B)

some redesign of certain functional components and stiffening of various other components. Generally, this work was aimed at vibration reduction.

On 23 May the program of modification was initiated. This program, including testing of the modifications, was carried out until the beginning of July, at which point flight testing was initiated.

The flight test program, scheduled for completion on 1 August, continued until 15 August due to a delay in the availability of the test vehicle. Four tests were conducted, of which the last two achieved good focus. The resulting photographs showed a substantial improvement over previous results [7] (see figure 1), and the oscillographic records of in-flight vibration indicated that reduction to tolerable levels had been achieved. [8] It was also concluded that some additional work should be done to improve stabilization and IMC. [9] Furthermore, some additional areas required investigation, but it was believed, if reliable operation could be quickly established, that the configuration was ready for operational commitment, so that operational problems could be assessed. The subcontractor stated that the configuration was now capable of reliable operation. [10]

A new effort, scheduled to conclude on 30 September, was initiated on 21 August. [11] This effort was intended to clean up the System, and was to include four simulated missions. During the conduct of this program substantial difficulties were encountered. The first of these, which unfortunately produced a great deal of unnecessary trouble and finally precluded, because of lost time, the last three simulated missions, was a misconnection of the lens heaters so that the system was out of focus for the first simulated mission and two test flights. In addition to this difficulty, the stabilization system and the shutter each had several malfunctions, and only with considerable luck were any useful photographs obtained during this period.

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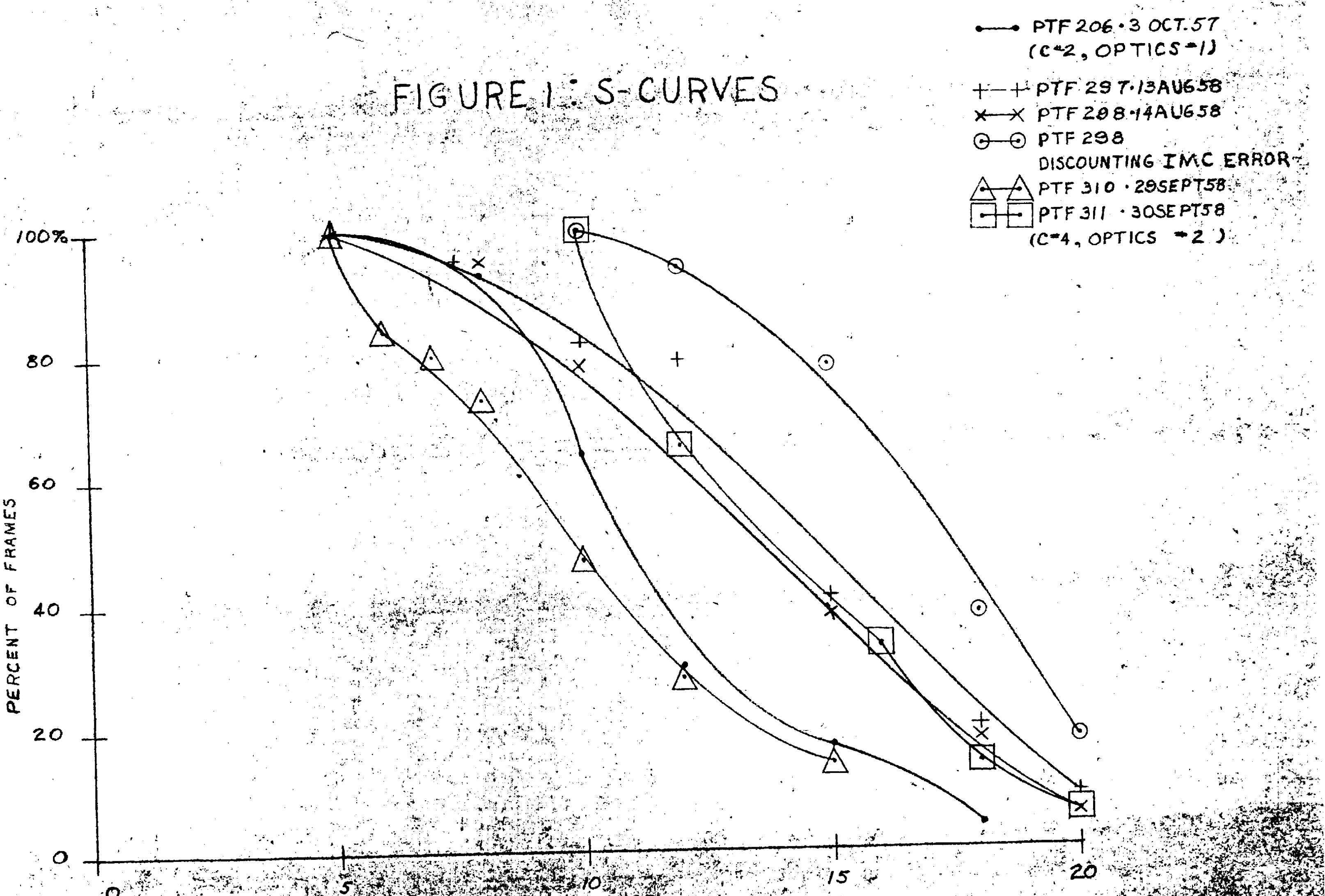
7 - Engineering Report 5300, page 10
8 - Engineering Report 5300, page 11
9 - Engineering Report 5300, page 14
10 - Engineering Report 5300, page A-3
11 - Meeting of 21 August 1958

FIGURE 1: S-CURVES



A decision was reached in early October to initiate a three-month program.[12] This program was expected to consist of three phases: One month was to be evaluation and repair of the difficulties; the second month was to be operational testing; and the third month would be devoted to quality improvement by a Red-Dot series. It was decided, however, that each phase would be carried to completion regardless of the schedule,[13] and, consequently, the first phase was still in progress in early December. All the work required on the configuration during this period was electro-mechanical in nature, although the subcontractor asserted that positioning was the only problem, and further claimed that it was basically satisfactory. The subcontractor also stated that the shutter merely needed a spring adjustment.[12]

During October, tests were conducted, and modifications were made. It was then decided that some ground tests would be conducted at the test site prior to flight testing.[14] It was expected that these ground tests would run until the middle of November and would on the ground show the configuration was capable of correct operation or would permit analysis of malfunctions. When the configuration arrived at the test site, the optical image from the collimator was found to be very poor. A substantial effort was expended in temperature tests and in locating this difficulty, but it was finally ascertained that the collimated beam from the collimator was being distorted. In addition to this, difficulties in getting the configuration operational delayed completion of the first ground run until 5 December. This run resulted in several electromechanical failures.

It was then proposed that the configuration be returned to our plant for an orderly examination and removal of all electromechanical difficulties.[15] This was tentatively accepted, but it was decided to conduct a second ground test, since the subcontractor insisted that the configuration was ready to operate correctly. The configuration again failed to operate correctly.

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12 - Meeting of 2 October 1958
13 - Engineering Report 5335, page 5
14 - Meeting of 29 October 1958
15 - Meeting of 10 December 1958

Then, it was again proposed that the configuration be returned to our plant, but the customer decided, instead, to stop all work.[16]

16 - Meeting of 11 December 1958

SIGNIFICANT ACHIVEMENTS

The entire nature of the "C" program during the period covered in this report was essentially one of evaluation and subsequent change in an effort to make operable an existing equipment. There were very many changes proposed. Those changes which were finally incorporated, and which ultimately led to a system improvement must necessarily be considered program achievements. The nature and scope of these achievements runs the gamut from the extremely simple and obvious to the complex and subtle. The mention of simple achievements is omitted in this report because they are not noteworthy as the expected results of a program of this nature. However, some of the more complex achievements, even though they can also be considered expected, are mentioned:

Vibration Reduction: The major facet of this program from a man-hour standpoint, can be considered to be the vibration reduction program. Essentially, the program consisted of determining whether an actual vibration problem existed, the exact nature and magnitude of this problem, determining expedient and feasible methods of overcoming these vibration problems, and finally, executing and testing solutions to the problems. Robinson Aviation, Incorporated, acted as consultants during this phase of the development program.

It was necessary to make a very realistic evaluation to determine just what changes were feasible from a time, money, and structural design standpoint, since obviously, certain improvements which were indicated, could not be implimented because of the already advanced stage of the equipment. Feasible changes were incorporated in the equipment, and in the final analysis proved to be well chosen. Both ground test results and actual flight tests showed significant improvement in the resultant optical imagery due to the elimination of vibration exciters and due to the strengthening of inadequate optical support structures.

To complete the vibration study aspect of the program, special attention was given to determine whether the fixes which had been incorporated eliminated the vibration problem to such an extent that it was no longer the factor limiting the ultimate result. It was the opinion of the prime contractor that with the incorporated fixes, the vibration problem was no longer the limiting cause of degradation.

The vibration program was approached in a systematic and orderly manner. In retrospect, it seems that the approach was well justified in that the program seems to have been complete in that it fully accomplished its goal.

Shutter: Quite early in the vibration study program it was realized that a major contributor to poor end results of the C System was the existing shutter. It was felt that it not only was a cause of very large mechanical excitations, but also was unreliable in operation. Subsequently, a study program was outlined to improve the shutter.

A new shutter concept which still employed the basic shell of the existing shutter was proposed by the subcontractor. A model was built and found to be a significant improvement vibrationally, but it was unreliable. Further improvements were suggested by the prime contractor based upon testing the prototype shutter. After more tests, a final shutter ultimately evolved, which is a very large improvement over the original.

Test Practices: Quite early in the program it became obvious that certain techniques would have to be developed for ground testing and analyzing the individual components as well as the operating configuration. The development of these techniques into useful research tools, as they essentially must be considered, was a difficult and significant achievement. The ability to test separate aspects of a complex interdependent system required somewhat sophisticated testing practices if the results were to be meaningful.

Techniques were developed where photographic resolution could be determined on the ground with various individual components operating under controlled conditions. This enabled the isolation of offending members, and enabled a prediction to be made of expected in-flight results. Simulated flight environment conditions were established on the ground for certain tests to establish simulated in use conditions. Finally, techniques were developed for an actual ground based flight incorporating essentially all features the configuration would encounter during natural flight. These "flights" were well instrumented so that operation of all critical components could be observed.

The significance and accuracy of the test practices becomes evident when predictions based upon data gained from them is compared to actual fact. It shows that the tests were both effective and accurate, as well as extremely necessary in developing a piece of equipment of this nature.

Learning: Perhaps somewhat apart, yet rightfully significant in considering specific achievements, is the intangible achievement of experience gained. The necessity of a detailed, systematic and organized approach to all aspects of every area is necessary for even moderate success of any equipment of a complex nature such as this configuration. The necessity of proper testing techniques, and of knowing how to interpret the test results is necessary. The proper coordination of personnel working on the separate aspects of a program of this nature is highly essential for its ultimate smooth operation. The experience gained and capability established in this program shall be invaluable when applied to similar projects in the future.

Performance In Use: Of course, the ultimate in use performance is the best measure of the specific achievement, since the program was aimed towards this goal. Unfortunately, no flight tests were attempted just prior to the time the program was terminated, so that the only results which are available on this effect date more nearly to the middle of the program. They indicate that the approach taken was essentially the correct one; significant improvements in ultimate performance was dramatically shown in the several flights in August. The improvement manifested itself in a gross increase in the line per millimeter resolution level obtainable, in the uniformity of format, in the improved optical imagery, and in the somewhat improved general mechanical performance. The performance results also indicated areas of further work, such as the difficulty in the IMC, and stabilization aspects.

It is difficult to assess the performance improvement in quantative terms, since to a large measure it is still a matter of opinion. However, the consensus seems to be that resolution was brought up to a level of approximately 15 to 18 lines per millimeter from a level of about 8 to 10 lines per millimeter.

APPRAISAL OF PROGRAM EXECUTION

It is valuable to appraise those non-technical factors which have increased the difficulty of successfully executing this program, since the recognition of these factors should assure less difficulty during future programs. In retrospect, several factors are apparent:

(1.) The initial analysis of the configuration in this program was concerned with vibration almost exclusively. The prime contractor did not invest effort to improve the optical system (which was considered acceptable for operation), but instead devoted its technical efforts to operating and testing the configuration for the analysis; the principal subcontractor's technical efforts primarily were directed to compilation of a Summary Report. Some technical assistance was provided to initially set-up and operate the configuration, as well as to provide instruction to the prime contractor; and finally assistance to maintain the configuration in an operating and calibrated condition was required.

Neither the subcontractor's technical personnel nor the Summary Report provided any reason for concern with the electromechanical aspects of the configuration. Therefore, it was erroneously concluded that modifications to reduce vibrational disturbances would permit the configuration to operate usefully. A more critical attitude by the prime contractor might have elicited data establishing the electromechanical difficulties.

(2.) The difficulties of creating a cooperative effort with the principal subcontractor during the vibration analysis induced the prime contractor to propose, in May, that any continuation of the program should be undertaken without the subcontractor. This proposal was not accepted, since the customer felt that the considerable facility of the subcontractor should be utilized to the greatest extent possible. The efforts which the subcontractor brought to bear on the problems did not produce sufficient improvement in the configuration's operation; and, the pursuit of another course such as the one proposed by this contractor would have, at least, been no less fruitful.

It is now felt that the prime contractor should have insisted, in May, that further work be carried out solely with subcontractors and consultants of the prime contractor's choice. Admittedly, the prime contractor had not yet assigned to the project group all the required engineering capability; consequently, there would have been some inefficiency, although the substantial electromechanical difficulties would have been exposed much earlier than actually occurred.

(3.) At meetings of a prime contractor and customer in which decisions are considered, the presence of a subcontractor is unusual, and it can foster a situation wherein the subcontractor is encouraged to act less as a subcontractor and more as a co-prime contractor. Undoubtedly there are benefits which can be derived from joint meetings, but in this program it encouraged the subcontractor to pursue independent courses of his own choosing and consequently impeded progress toward the contractor's objectives.

(4.) As the prime contractor was able to assign additional engineers to the project group, thus enhancing the overall capability in non-optical aspects of the configuration, various methods of contributing additional assistance to the subcontractor were attempted, since it was simultaneously apparent that very considerable technical improvements were required in the performance of the electromechanical aspects of the configuration. The inability of the subcontractor to benefit successfully from the availability of additional skills, prevented this approach from improving the configuration's performance. The program could have been greatly benefitted if the prime contractor had found a method by which his enhanced capability could have been applied as it became available.

The complimentary objective of the program as set up in May was achieved only in part since to a very large extent the personnel portion of the subcontractor's facility was gradually lost to this program and only the physical plant portion of the facility continued.

(5.) The entire program (nine months) was composed of four distinct sub-programs. Despite the compelling business considerations favoring this segmentation, it impeded the organization of necessary studies, and also created some inefficient duplications of effort.

These various factors all were important influences on the program. The avoidance of similar situations should produce a more effective program.

RECOMMENDATIONS FOR SIMILAR DEVELOPMENT PROGRAMS

Apart from the basic requirement of a unified and coordinated initial design, there must be a full exchange of information between the groups (or individuals) working on separate aspects of any complex system. A coordination of the separate aspects within the scope of the basic design goals and a realization of pre-established tolerances must be achieved. This requires not only an unequivocable basis for these tolerances but also the complete understanding of them by the groups concerned. Any change from agreed planning must be communicated and agreed upon by all parties concerned prior to implementation. Only with such a complete and unhindered exchange of information will a program progress in the direction consistent with original goals.

In the case of systems intended for use in environments or areas where their actual performance cannot be conveniently observed, such as airborne instruments, there is an imperative requirement for ground testing. The fulfillment of this requirement means a comprehensive testing program which runs the gamut from basic component testing to, where possible, simulated ground based "flights". Furthermore, it is both important and desirable to plan both ground and flight instrumentation so that comparative data can be obtained. This will generally permit an assessment of flight difficulties on the ground.

For the testing to have maximum value, proper emphasis must be placed upon the importance of appropriate instrumentation, upon the necessarily meticulous care with which records of instrumentation must be maintained, and upon the function of reduction and appraisal of test data. The complete understanding of a test's results is a necessary prerequisite to any modification.

The elaborate facilities and equipment required for meaningful testing and modification are not, in general, available at a flight test sight. The only testing which can intelligently be undertaken there is flight testing. The inefficiency, cost, and extreme difficulty of component or system testing at a flight test sight prescribes flight tests on equipment already fully tested at the factory. This will make maximum use of facilities, time, and manpower and, in general, will yield more worthwhile results.

In those cases where reliability is a concern, accurate unified records of component failures and malfunctions are indispensable. This is even more important if several identical systems are being produced. To have maximum value, the records should be faithfully maintained from the time when the first component is assembled for test, since it is impossible to collect this information later from the memory and separate records of numerous engineers and technicians.

APPENDIX A

LIST OF PERTINENT REPORTS

Date	Number	Title
11 April 1958	5232	Proposed Evaluation Program for HR-73-C Configuration
5 May 1958	—	Summary Report of Configuration 73-C Tests
14 May 1958	5249	Evaluation of the HR-73C Configuration
21 May 1958	5254	Proposal for Modification to HR-73C Configuration
June 1958	—	Proposed Program to Modify HR-73C Configuration
18 July 1958	—	"C" System Test Program
July 1958	—	Substitute Test Program (Untitled)
20 August 1958	5300	Modification and Test of the HR-73C Configuration
17 October 1958	5335	Proposed Program for HR-73C Configuration, 1 October 1958 - 31 December 1958
8 December 1958	—	Summary of Activity 29 October - 5 December 1958
9 December 1958	—	Proposed Reliability Evaluation and Modification (Untitled)

Date	Place	Person																				
		SWB	FR	LK	RSQ	LEW	MDR	RMS	TPF	JC	CDC	PFF	WMcF	WAS	JHS	JMcD	BH	EBW	BAR	CMH	BW	HRE
16 May 1958	PE	X					X			X								X				
22 May 1958	WPAFB	X	X	X	X		X	X	X				X	X	X	X	X	X			X	
25-26 June 1958	H		X				X							X	X							
1 July 1958	WPAFB	X	X				X										X					
21 August 1958	WPAFB	X	X		X	X	X		X	X				X	X	X	X	X			X	X
11 September 1958	WPAFB	X	X				X			X	X						X		X			
2 October 1958	WPAFB	X			X	X	X			X	X			X	X	X	X		X			X
29 October 1958	H	X	X				X	X						X	X							X
10 December 1958	H	X	X		X		X	X		X		X		X	X					X		X
11 December 1958	LA	X	X				X	X												X		

APPENDIX B - PRINCIPAL CONFERENCES AND PRINCIPAL ATTENDING PERSONNEL

APPENDIX C

SUMMARY OF FLIGHT AND GROUND TESTS

Approved For Release 2002/08/07 : CIA-RDP81B00878R000100060049-7

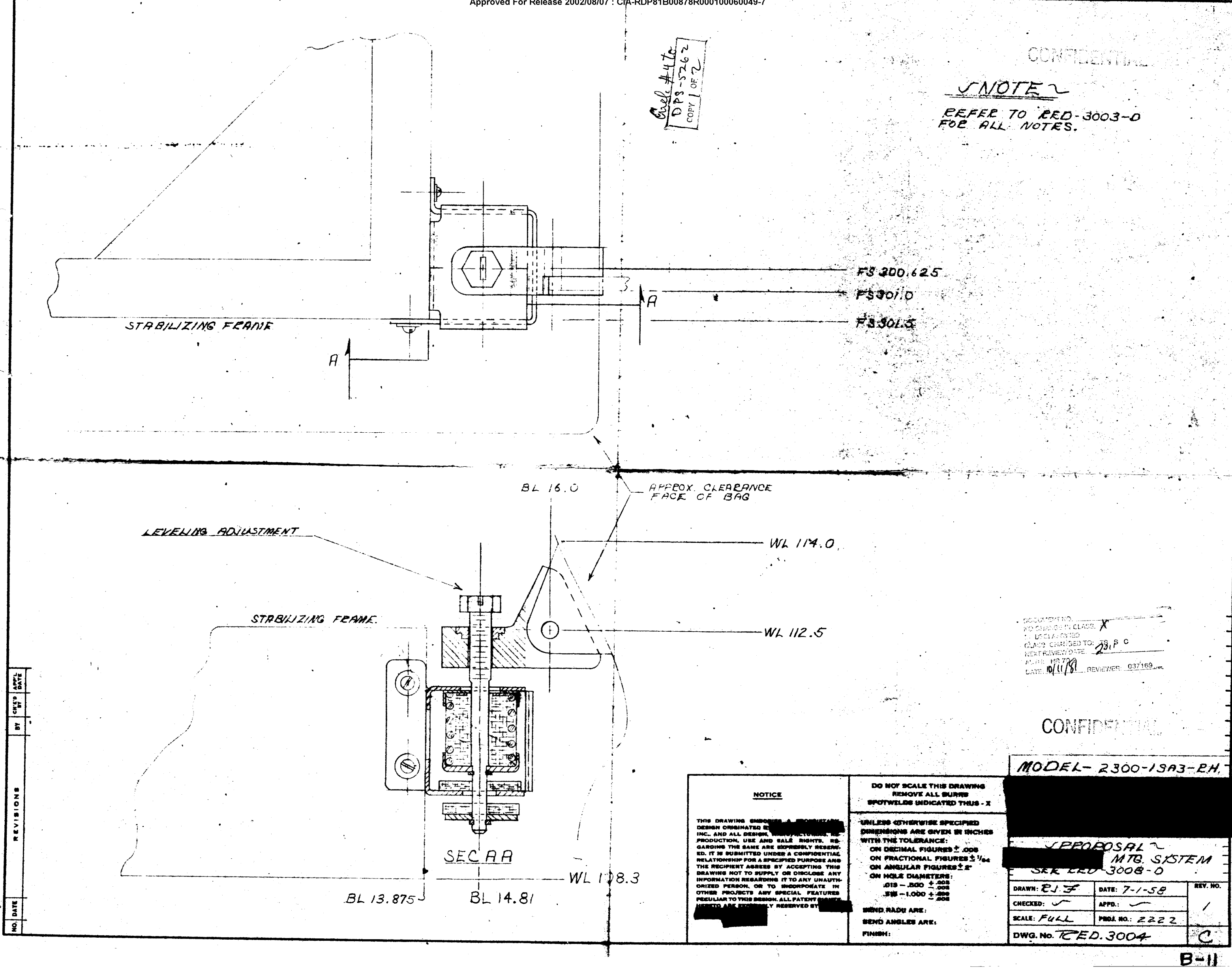
Significant PRE-PTF	PTF No.	PTF Date	Purpose	Significant Post-PTF	Results	Significant Changes
	308	23 Sept. '58	1. Focus and squareness. 2. Photo quality at high obliques. 3. Stabilization operation. 4. IMC calibration.	1. Roll extensometer slug missing.	1. Very poor focus. 2. Motion	1. Focus rechecked. 2. Platen tilted. 3. Lens heater thermostat reset to 70°F. 4. Q-Bay hatch blackened. 5. Autobalance sensitivity increased. 6. Shutter modified. 7. Transistors changed in position servo. 8. New engine in vehicle.
Loaded vehicle Run 1 hour on ground.	310	29 Sept. '58	1. Focus and squareness. 2. Shutter operation 3. Stabilization and IMC operation. 4. Temp. in position servo. 5. Temp. of field-projection optics. 6. Learn new engines vibration.	1. Static imbalance. 2. Optics temp. below 80°F. 3. Shutter set screw loose.	1. Varying exposure. 2. Mode 1 malfunction. 3. Focus improved and located on tilted platen. 4. Image doubling and motion in flight direction. 5. IMC variation. 6. Many unexposed frames. 7. Focus fixture .000" different from tilt data.	1. Platen squared and focus adjusted. 2. Shutter replaced. 3. Repair of Mode 1.
	311	30 Sept. '58	1. Focus and squareness. 2. Stabilization and IMC operation. 3. Recheck optics temp. control. 4. Check mode 1 operation. 5. Maximum quality.	1. Data counter not working. 2. Malfunction due to film wrap.	1. Film wrap due to untaped splice. 2. Areas of good focus varied on format. 3. Gyro rates severe. 4. Motion evident.	1. Electric rack shimmed (C-1). 2. Scan flat balanced (C-2). 3. Temperature control packaged (C-3). 4. Data recorder focused (C-5). 5. Optics re-aligned (C-6). 6. Film covers padded (C-7). 7. Programmer cover stiffened (C-8). 8. New temperature sensor installed (C-12). 9. Scan motor connection replaced (C-13). 10. Compartment and Rod heaters removed - (C-14, C-19). 11. Relay K-23 removed (C-15). 12. Autobalance malfunction investigated and readjusted (C-17, T-22). 13. Levels reversed (C-18). 14. Filter mounting tests and mods. (T-2, C-9). 15. Shutter modified (C-10, C-11). 16. Replacement of metering drive motor flexible shaft (C-16). 17. Temperature controller modified (C-20). 18. Remove obsoleted parts and wiring (C-21). 19. Programmer adjusted (C-22). 20. Replacement of original temperature sensor (C-23). 21. Modify film drive servo circuitry (C-24). 22. Investigation of film wrap and new take-up motor (C-25, T-28). 23. Change switches on film drive (C-26). 24. Modify faulty solenoid valve assy. (C-27). 25. Remove spacer washers and clean surface of platen, (C-28). 26. Determine cause and repair short-circuited shutter wiring (T-29, C-29).

Significant PRE-PTF	PTF No.	PTF Date	Purpose	Significant Post-PTF	Results	Significant Changes
	G-1	5 Dec. '58	1. Establish correct electro-mechanical operation in ground simulated flight conditions: A. Gyro rates B. IMC and positioning C. Test temperature controls D. Check for vibrations of scan flat E. IMC drift		1. Intolerable IMC fluctuations. 2. Roll and yaw position variation. 3. Transcient movements in scan flat. 4. Vibrations evidenced in scan flat. 5. Pitch flexure broke twice. 6. Oblique servo malfunctioned.	1. Determine cause and correct oblique malfunction (T-30, C-32). 2. IMC and stabilizer re-adjusted. 3. Repair of broken flexure (C-31, C-30).
	G-2	11 Dec. '58	1. Electro-mechanical operation. 2. Gyro rates. 3. Vibrations of scan flat. 4. IMC drift.		1. Intolerable fluctuations of IMC. 2. Transcient movements in scan flat. 3. Pitch flexure broke. 4. Gyro rate and vibration tape data unusable due to poor tape emulsion.	None

System Status	Collimator Serial No.	Date	Resolution (Lines/mm)	Exposure (Secs.)	Plate or Flight No., Observers' Initials	Engineering Notebook Number and Page
Initial photographic evaluation at plant.	2	18 Apr.	37	.001	P11	878/24
	2	"	47	—	DHS, FFF, MDR, JJMcN	878/25
	2	21-22 Apr.	42	.001	P12 & P16	878/29-30
New collimator not perfectly aligned.	5	24 Apr.	67	—	DHS, JJMcN	878/34
	5	"	47	.001	P34	"
	5	"	75	—	DHS, JJMcN	"
	5	"	53	.001	P36 & P37	"
Collimator aligned	5	30 Apr.	83	—	DHS	878/43
	5	"	47	.001	P46	878/44
	5	"	83	—	DHS, JJMcN	"
	5	"	53	.001	P49	"
	5	5 May	83	—	DHS, JJMcN	878/48
Modified System realigned at farm	5	8 Jul.	47	.01	P112	878/73
Collimator refocused	5	9 Jul.	60	.01	P113	878/75
Realigned system	5	16 Jul.	83	—	JJMcN , KWO	878/78
Squared platen	5	30 Jul.	83	—	JJMcN	878/87
Out of focus	—	31 Jul.	~10	—	PTF 292 scenes WAS, STB, JVS	879/133
Better focus	—	7 Aug.	11 ∥ FLT 7 ⊥ FLT	.003	PTF 295 avg. of Res. Targets	879/146
Good focus	—	13 Aug.	35	.003	PTF 297, frame 3634. Lens-Film Limit	878/125 879/148
	—	"	20	.003	PTF 297 9% of Frames	879/151
	—	14 Aug.	20	.004	PTF 298 6% of Frames	879/151
Optical system disassembled and reassembled. Resolution target was inferior to one used previously.	5	27 Sept.	67	—	JJMcN	921/4
Tilted platen	—	29 Sept.	15	.004	PTF 310 14% of frames	903/35
	—	"	7 ∥ FLT 4 ⊥ FLT	.004	PTF 310 Avg. of Res. Targets	(PTF 310 File)
Good Focus	—	30 Sept.	20	.003	PTF 311 5% of Frames	903/43
	—	"	8 ∥ FLT 8 ⊥ FLT	.003	PTF 311 avg. of Res. Targets	(PTF 311 File)
Multiple image (Heat on in C-room at test site)	5	15 Oct.	67	—	JJMcN, FFF	921/8-9
System not in alignment	5	16 Oct.	67	—	JJMcN, FFF	921/13
System realigned	5	6 Nov.	67	—	JJMcN, FFF	921/28
	5	10 Nov.	53	—	JJMcN, FFF	921/38
	5	11 Nov.	60	—	JJMcN, FFF	921/41
	5	14 Nov.	60	—	JJMcN, FFF	921/49
	5	25 Nov.	30	.001	P150	(Plate data file)
System disassembled and reassembled	Autocollimation of C	3 Dec.	100 (±20%)	—	KWO, JJMcN, WRO, MDR	921/67

APPENDIX D - RECORD OF SYSTEM RESOLUTION

This table shows static, visual, and flight resolution throughout program. The effect of vibration on static resolution is shown in Engineering Reports 5249 (pages 8, 36-38) and 5300 (page F-1).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NOTE
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FS 301.5
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APPROX. CLEARANCE FACE OF BAG
LEVELING ADJUSTMENT
WL 114.0
STABILIZING FRAME
WL 112.5
SEC AA
WL 108.3
BL 13.875
BL 14.81
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SPOTWELDS INDICATED THUS - X
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE GIVEN IN INCHES WITH THE TOLERANCE:
ON DECIMAL FIGURES ± .005
ON FRACTIONAL FIGURES ± 1/64
ON ANGULAR FIGURES ± 2°
ON HOLE DIAMETERS:
.013 – .500 +.005 −.002
.515 – 1.000 +.005 −.002
BEND RADII ARE:
BEND ANGLES ARE:
FINISH:
MODEL- 2300-13A3-RH.
[redacted]
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[redacted] MTG. SYSTEM
SEE RED-3008-D
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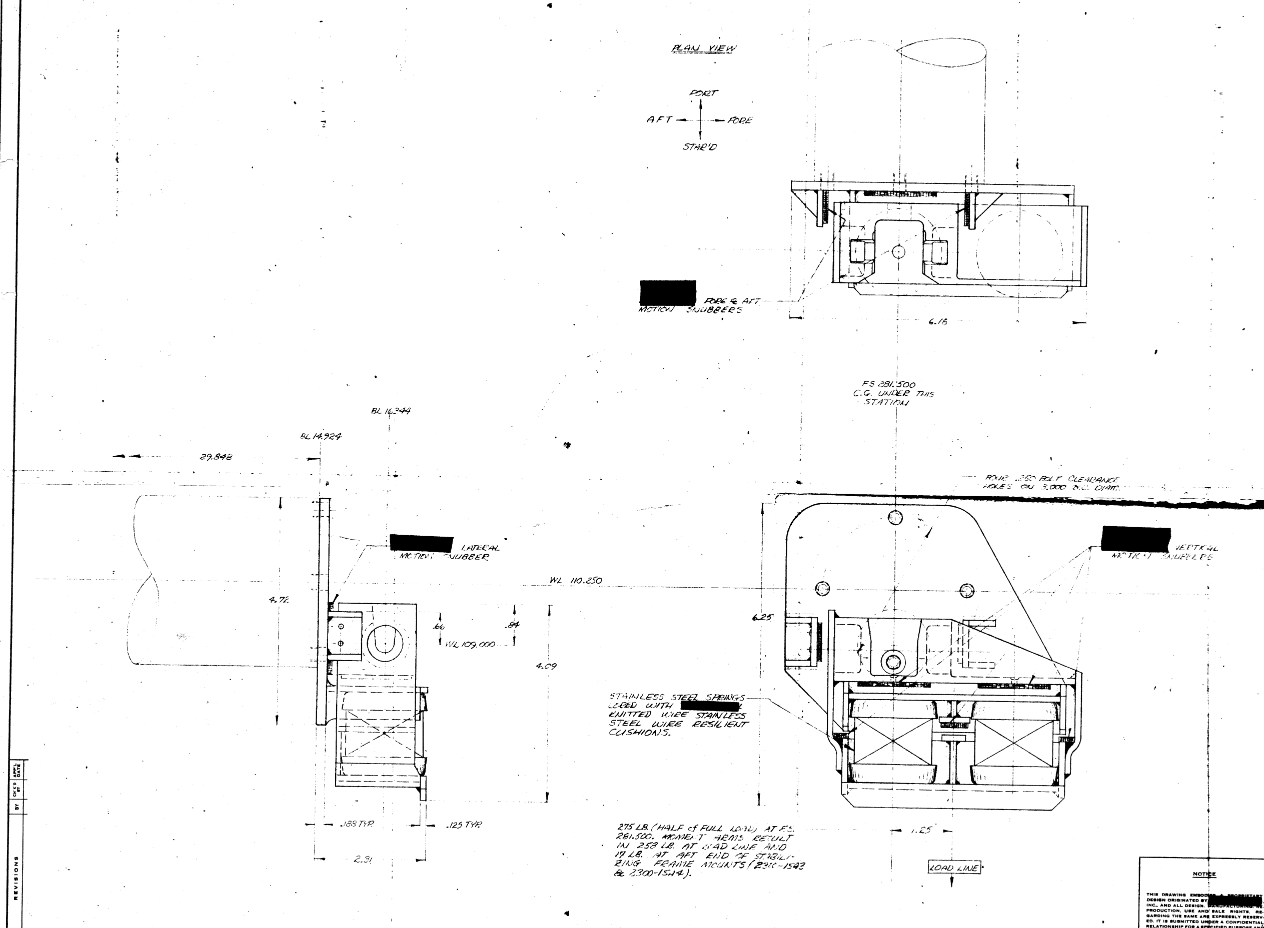

NOTES

DARK LINES INDICATE MODEL 2300-1 ELEMENTS. LIGHT LINES REFERENCE CUSTOMER ITEMS.

REFER TO RED 3004 FOR AFT MOUNT DETAILS.

MOUNTING SYSTEM MODEL 2300-1 CONSISTS OF FOUR (4) ITEMS AS FOLLOWS:

1. ONE (1) 2300-1SA1-RH (RIGHT HAND - SHOWN)
2. ONE (1) 2300-1SA2-LH (LEFT HAND - NOT SHOWN)
3. ONE (1) 2300-1SA3-RH (RIGHT HAND - RED 3004)
4. ONE (1) 2300-1SA4-LH (LEFT HAND - RED 3004)

SYSTEM (APPROX.):
VERTICAL - 5 C.P.S.
LATERAL - 6 C.P.S.
LONGITUDINAL - 6 C.P.S. } @ .020" D.A. INPUT

MOUNTING SYSTEM 2300-1 WILL WITHSTAND AS A MINIMUM THE FOLLOWING ULTIMATE LOADS:

6G VERTICALLY DOWNWARD - GUST
2½G " UPWARD
2½G LATERAL
2½G AFT } MANUVER
8 G FORWARD CRASH

ESTIMATED TOTAL WEIGHT OF 2300-1 SYSTEM = 5.8 LB.

MATERIALS:
STRUCTURE - 5052 & 6061 AL. ALLOY, CUT PLATE & MACHINED BLOCK - WELDED.
RESILIENT ELEMENTS - STAINLESS STEEL.

FINISH:
ANODIZE OR CADMIUM PLATE AS APPLICABLE.

THIS MOUNTING SYSTEM REQUIRES CLEVIS RINGS, SPRING & BALL DETENTS, AND OTHER CLEVIS BLOCK HARDWARE TO BE SUPPLIED TO [redacted] FOR ASSEMBLY INTO MOUNTING SYSTEM PRIOR TO WELDING.

Encl. # 3 to DPS-5262
COPY 1 OF 2

CONFIDENTIAL

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DO NOT SCALE THIS DRAWING
REMOVE ALL BURRS
SPOTWELDS INDICATED THUS - X

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE GIVEN IN INCHES WITH THE TOLERANCE:
ON DECIMAL FIGURES $\pm$ .005
ON FRACTIONAL FIGURES $\pm$ 1/64
ON ANGULAR FIGURES $\pm$ 2°
ON HOLE DIAMETERS:
.013 – .500 $^{+.005}_{-.002}$
.515 – 1.000 $^{+.008}_{-.002}$
BEND RADII ARE:
BEND ANGLES ARE:
FINISH:

[redacted]

PROPOSAL
MODEL 2300-1 [redacted]
M'T'G SYSTEM (SEE RED 3004)

DRAWN		DATE: 7-1-58		REV. NO.
CHECKED:		APPD.:		1
SCALE: FULL		PROJ. NO.: 2222		
DWG. No. RED 3003				D

RED 3003 D

B-10

STATINTL